

# Sit Less or Exercise More?

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# VALORISATION

## Social relevance

In the 21st century, people in westernised countries are living in a sedentary-promoting environment. Urbanisation promotes the use of motorised vehicles and labour-saving devices have been developed in order to increase the 'efficiency' of daily tasks at the expense of human locomotion. Examples include cars, dishwashers and elevators. In the last decades, the use of screens (e.g. TV's, laptops and smartphones) is making us even more sedentary. As a result, sedentary behaviour has increased and physical activity levels have dropped since the begin of the 20<sup>th</sup> century.

The increase in sedentary time has been associated with an increased risk of cardiometabolic diseases, depression and premature mortality, independent of the time spent in moderate-to-vigorous physical activity (e.g. structured exercise). The societal and economic burden of these diseases is high and can be partially prevented. Worldwide, government parties developed physical activity guidelines in order to increase physical activity. These guidelines advise to perform 30 minutes of moderate-to-vigorous physical activity (e.g. exercise) five times per week. However, these guidelines do not provide guidance on what to do the other 15.5 waking hours of the day. Is it for instance also healthy to be sitting 15.5 h/day because you perform 30 minutes of exercise daily? What about the non-exercise activities (standing, cooking, doing groceries, dishwashing, vacuuming)? Epidemiological studies observed that we perform on average about 8 h/day of light-intensity activities. Is its health effect negligible? The results of the studies presented in this dissertation suggest that the negative effects of sitting the entire day cannot be fully compensated by daily moderate-to-vigorous physical activity (e.g. exercise) only. We observed that substituting sitting with daily (light) activities was at least as important as moderate-to-vigorous physical activity to improve cardiovascular risk factors. Moderate-to-vigorous physical activity had additional health benefits which cannot be achieved by performing light activities only. Vice versa, light physical activity was more effective than moderate-to-vigorous physical activity for some cardiovascular risk factors. Thus, not only moderate-to-vigorous physical activity but also light physical activity seems important to improve cardiovascular risk factors.

## Physical activity guidelines

A body of observational evidence suggests that sedentary behaviour is an important risk factor for cardiometabolic health. It is important that society gets informed about the negative health effects of too much sitting and about strategies to decrease sedentary behaviour. Indeed, in recent years, governments have formulated 'sedentary behaviour guidelines'. Physical activity guidelines from The Netherlands, UK and Australia advise now to reduce daily sitting time. Other physical activity guidelines will be updated soon.

While we spend on average about 8 h of our day in light physical activity, the physical activity guidelines do not or hardly provide guidance on light physical activity. The studies presented in this thesis underline the importance of substituting sitting with light physical activity for cardiometabolic health. In addition to epidemiological evidence, our studies are supported by a rapidly expanding amount of intervention studies. Based on the evidence available, in my opinion, the physical activity guidelines should also advise to increase light physical activity. In contrast to most physical activity guidelines, a position statement from an international group of experts recommends people with a desk based job ‘to accumulate at least 2 h/day of standing and light activity (light walking) during working hours’. While it must be admitted that further research is necessary to determine the optimal dose of daily light physical activity (e.g. standing and ambulatory activities), it is better to have some kind of guidance based on non-conclusive evidence than to have no guideline at all. For instance, in line with recent guidelines on sedentary behaviour, guidelines can also advise to increase light physical activity without the need to specify its duration.

## Translation into practice

In addition to guidelines, there are many possibilities for government agencies and companies to provide people with the opportunity to decrease sedentary behaviour and increase physical activity on a daily basis. As our society is ‘built to sit’, there are many possibilities to encourage daily physical activity in all age groups, for instance by making streets walk and bike friendly, (re)building schools with more (green) playgrounds and replacing sitting desks by sit-to-stand/walk desks. People with a high daily sitting time are often people who need to perform their work in a seated position. Based on the evidence available, spending about 8 h/day seated at work seems an important work-related health risk. Replacing ‘normal’ sitting desks with sit-to-stand/walk desks provides employees at least the choice between sitting and standing. Unfortunately, the opposite is true in most countries, many employees are now obligated to perform their work in a seated position.

The results from this dissertation may encourage people at individual level to decrease sitting time in various ways at work and in their leisure time. As a day counts 16 waking hours, there are many possibilities to incorporate more physical activity into daily life; examples include biking to work, parking the car further from work, taking the stairs instead of the elevator, walking during lunch breaks, phone calls and meetings while standing or stepping, walking the dog, etc. Whilst screens in general seem to increase sedentary behaviour, screens can be a friend as well to decrease sedentariness. For instance, the popularity of ‘activity watches’ and activity applications on smartphones is increasing rapidly. These devices are in general not able to identify posture (sitting/standing/lying) but are accurate in the measurement of physical activity. Given the

wide use of activity trackers, the possibility to be carried 24 h/day and immediate feedback options, they provide a unique opportunity to reduce sedentary time at a personalised level.

### **Recommendations for further research**

Studies carried out so far have identified prolonged sitting as a cardiovascular risk factor and intervention studies of short duration found that substituting sitting with light physical activity improved cardiovascular risk factors. Dose-response studies are now needed to inform about the optimal intensity, duration and pattern of non-sitting as well as time spent in light physical activity. For instance, the health effects of different types of sedentary behaviour (sitting in a couch versus sitting at a desk versus sitting on a fitness ball) have yet to be identified. Especially, long-term studies are needed to define the optimal dose and pattern that is effective and feasible in real life circumstances. In parallel, more fundamental research is necessary to understand the underlying biological mechanisms of light physical activity on cardiometabolic health.

In addition to risk factors and biological mechanisms of disease, RCT's are needed to investigate the long-term effect of increasing light physical activity on the incidence of cardiometabolic diseases. Along with the focus of this dissertation on cardiometabolic health, further research should shed light on the effect of sedentary behaviour and light physical activity on other health aspects including bone metabolism, liver function, inflammation, mood, cognition and mortality.

